WHAT IS CLAIMED IS:

1. A semiconductor laser module comprising:

narrative method of apparatus

an optical wavelength conversion element which is formed such that on a ferroelectric crystal substrate having a non-linear optical effect, a TE mode optical waveguide which extends along a substrate surface and in which a polarization direction is parallel to the substrate is formed, and a domain inversion portion, where a spontaneous polarization direction of the substrate is inverted, is periodically formed in the optical waveguide, and the optical wavelength conversion element converts a wavelength of a fundamental wave which propagates in the optical waveguide in a direction along which the domain inversion portions are aligned; and

a semiconductor laser which can emit a laser beam in the TE mode in which a polarization direction is parallel to the substrate and which can adjust a center wavelength of stimulated emission of the laser beam, and light emitted from the semiconductor laser is made to enter the optical waveguide,

wherein said optical wavelength conversion element and said semiconductor laser are mounted such that the polarization directions of the TE mode coincide with each other and a light exit portion of the semiconductor laser and a light entrance portion of the optical wavelength conversion element coincide with each other.

2. A semiconductor laser module according to claim 1, wherein the spontaneous polarization direction of said substrate forms a predetermined angle with respect to the substrate surface in a plane perpendicular to a propagation direction of the fundamental wave.

3. A semiconductor laser module according to claim 2, wherein said predetermined angle is larger than 0° and smaller than 20°.

4. A semiconductor laser module according to claim 2, wherein said predetermined angle is larger than 0.2°.

5. A semiconductor laser module according to claim 2, wherein said optical waveguide is formed by proton exchange and annealing, and said predetermined angle is larger than 0.5°.

6. A semiconductor laser module according to claim 2, wherein said predetermined angle is smaller than 20°.

7. A semiconductor laser module according to claim 1, wherein said semiconductor laser makes the center wavelength of stimulated emission of the laser beam coincide with a phase matching wavelength of the optical wavelength conversion element.

8. A semiconductor laser module according to claim 1, wherein said semiconductor laser includes a substrate, and said substrate of said semiconductor laser and said ferroelectric crystal substrate of said optical wavelength conversion element are directly bonded.

9. A semiconductor laser module according to claim 1, wherein said semiconductor laser and said optical wavelength conversion element are bonded together with an SiO_2 thin film interposed therebetween.

10. A semiconductor laser module according to claim 9, wherein a thickness of said SiO_2 thin film is 0.5 to 3 μm.

11. A semiconductor laser module according to claim 1, wherein said optical wavelength conversion element converts a wavelength of said fundamental wave to a wavelength of a second harmonic of said fundamental wave.

12. A method for forming a semiconductor laser module comprising the steps of:

forming an optical wavelength conversion element which is formed such that, on a ferroelectric crystal substrate having a How non-linear optical effect, a TE mode optical waveguide which

extends along a substrate surface and in which first a polarization direction is parallel to the substrate is formed, and a domain inversion portion where a spontaneous polarization direction of the substrate is inverted, is periodically formed in the optical waveguide, and the optical wavelength conversion element converts a wavelength of a fundamental wave which propagates in the optical waveguide in a direction along which the domain inversion portions are aligned, wherein in a What plane perpendicular to a propagation direction of the fundamental wave, the spontaneous polarization direction of the substrate forms a predetermined angle with respect to the substrate surface;

forming a semiconductor laser which can emit a laser beam in the TE mode in which second a polarization direction is parallel to the substrate, and which can adjust a center wavelength of stimulated emission of the laser beam, and light emitted from the semiconductor laser is made to enter the optical waveguide; and

mounting said formed optical wavelength conversion element and said formed semiconductor laser such that the polarization directions of the TE mode coincide with each other and a light exit portion of the semiconductor laser and a light entrance portion of the optical wavelength conversion element are made to coincide with each other.

13. A method for forming a semiconductor laser module according to claim 12, further comprising the steps of:

forming a substrate for fixing on which said optical wavelength conversion element and said semiconductor laser are mounted, the substrate for fixing having a flat surface and a stepped surface with a predetermined step which is parallel to said plane; and

mounting the optical wavelength conversion element to said flat surface of said substrate for fixing, and mounting the semiconductor laser to the stepped surface of said substrate for fixing.

14. A method for forming a semiconductor laser module according to claim 13, wherein said step can accommodate at least the semiconductor laser, and corresponds to a difference between a distance from an upper surface of the semiconductor laser to the light exit position of a laser beam and a distance from an upper surface of the optical wavelength conversion element to the optical waveguide.

15. A method for forming a semiconductor laser module according to claim 13, further comprising the steps of:

forming an optical wavelength conversion element holder which has a reference surface for light entry and is able to fix said optical wavelength conversion element such that a plane of light entry of said optical wavelength conversion element includes said reference surface for light entry;

forming a semiconductor laser holder which has a reference surface for light exiting and is able to fix said semiconductor laser such that a light exiting surface of said semiconductor laser includes said reference surface for light exiting;

fixing said optical wavelength conversion element to said optical wavelength conversion element holder, and fixing said semiconductor laser to said semiconductor laser holder; and

mounting said optical wavelength conversion element and said semiconductor laser such that the reference surface for light entry of said optical wavelength conversion element holder and the reference surface for light exiting of said semiconductor laser holder are joined.

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